

EQUISETUM HYEMALE var. *ROBUSTUM* (A. Br.) A. A. Eaton.
Common along margins of streams.

ISOETACEAE

ISOETES BUTLERI Engelm. Local in temporarily wet depressions of limestone glades.

ISOETES MELANOPODA J. Gay. Rare and local in spring at edge of chert glade near Joplin.

SELAGINELLACEAE

SELAGINELLA RUPESTRIS (L.) Spring. Very local but abundant in chert glade along Turkey Creek, near Joplin.

ARNOLD ARBORETUM

Annotated List of Ferns of the Kilauea-Mauna Loa Section of Hawaii National Park¹

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The Kilauea-Mauna Loa section of Hawaii National Park is located on the southeast side of the Island of Hawaii. It embraces an area of approximately 307 square miles of mountainous country which extends in a northerly direction from sea-level to the summit of Mauna Loa, 13,680 feet elevation. The diversified topography and wide range in elevation produce marked local differences in precipitation and in temperature. Freezing temperatures seldom occur below 4,500 feet elevation but are common higher up on Mauna Loa. The heaviest rainfall (80-100 inches) occurs in the region to the northeast of Kilauea Crater (4,090 feet), and the lightest (15-20 inches) occurs in the southwest, Kau Desert. Because of the wide range in elevation, various exposures, and extremes of aridity and moisture, the Kilauea-Manua Loa section supports a wide variety of ferns.

¹ Contribution no. 120 from the Department of Botany, University of Nebraska.

During the summer of 1937, the writer collected 60 species of ferns and their allies. Degener (1932) reports 6 more, which make a total of 66 species within the Park. Of these, 29 are believed to be endemic to the Islands. Ten additional species have been reported from contiguous areas and may range into the Park. The list which follows is probably not complete, as further surveys may add additional species.

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OPHIOGLOSSACEAE

OPHIOGLOSSUM CONCINNUM Brack. Pololei. Rare; in earthquake cracks near rim of Halemaumau, appearing after spring rains.

OPHIOGLOSSUM falcatum (Presl), n. comb. *Ophioderma pendulum* β *falcatum* Presl, Abh. Böhm. Ges. Wiss. ser. 5, 4: 315 (1845) repr. (Suppl. Tent. Pterid.) 56. Reported by Degener.

OPHIOGLOSSUM PENDULUM L. Laukahi. Not common. Epiphyte on trees near Keanakakoi and Makaopuhi Craters. The Hawaiians prepared an infusion from this species which they used as a cough remedy.

GLEICHENIACEAE

GLEICHENIA EMARGINATA (Brack.) Moore. Uluhe, False Staghorn Fern. Endemic. *G. dichotoma* Hooker, in part. *Dicranopteris emarginata* (Brack.) Rob. Common in open places throughout the eastern half of the Park to an elevation of about 4,000 feet, frequently forming dense thickets. The Hawaiians prepared an infusion from this species which they drank as a laxative.

CYATHEACEAE

CIBOTIUM CHAMISSOI Kaulfuss. Hapuu, Tree Fern. Common in rain forest. The ramentum ("pulu" of the Hawaiians) was used in early days as a surgical dressing and in mummifying the dead. Between 1851 and 1884, pulu was used as a stuffing material for mattresses, pillows and for upholstery purposes in California. At the height of the industry in 1862, 738,064 pounds were exported from the Islands. The trunks of tree ferns are rich in starch and during times of famine the Hawaiians cooked this material for food.

CIBOTIUM GLAUCUM (Smith) Hooker & Arnott. Hapuu, Tree Fern. In dry, open places in Kipuka Puaulu.

CIBOTIUM MENZIESII Hooker. Hapu Iii. Common in rain forest. This species is the tallest of the tree ferns. The pulu of this species was used by the Hawaiians in the same way as that of Hapuu. The ferns are generally about one foot in diameter and 12 feet high, although they sometimes attain a diameter of 3 feet and a height of 24 feet.

HYMENOPHYLLACEAE

HYMENOPHYLLUM LANCEOLATUM Hooker & Arnott. Epiphyte; common in rain forest.

HYMENOPHYLLUM OBTUSUM Hooker & Arnott. Occasional; on moss-covered tree trunks in rain forest.

HYMENOPHYLLUM RECURVUM Gaudichaud. Ohiaku. Endemic. A very common fern on moss-covered trees and damp rocks in rain forest.

TRICHOMANES DAVALLIOIDES Gaudichaud. Kilau. Common in damp woods and on shady cliffs.

POLYPODIACEAE

ADIANTUM CAPILLUS-VENERIS L. Iwaiwa, Maidenhair Fern. Common on moist, rocky places at Hilina Pali.

Stems were worked by Hawaiians into ornamental hats and baskets.

ASPLENIUM ADIANTUM-NIGRUM L. Iwaiwa. Common in open dry places at elevations of 2800 to 7000 feet.

ASPLENIUM CONTIGUUM Kaulfuss. Possibly endemic. Common in the rain forest. Fronds variable in size and depth of lobing.

ASPLENIUM LOBULATUM Mett. Piipiilau Manamana. *Asplenium pseudofalcatum* Hilleb. Very common in rain forest. Gemmae formation is common in this species and occasionally the fronds are forked.

ASPLENIUM MACRAEI Hooker & Greville. Endemic. *Asplenium erectum* var. *macraei* Hilleb. Occasional; in shady, rocky cliffs in Kipuka Puaulu.

ASPLENIUM NITIDULUM Hilleb. Rare; in Kilauea fern forest. Reported from vicinity of Byron Ledge by both Skottsberg and Degener.

ASPLENIUM RHIPIDONEURON Rob. Iwaiwa O Kane. Endemic. *Asplenium furcatum* Hilleb. Common in open, dry kipukas.

ASPLENIUM SPHENOLOBIUM var. DIPLAZIOSORUM Hieronymus. Occasional; in moderately damp places at Hilina Pali.

ASPLENIUM TRICHOMANES L. Owalli, Maidenhair Spleenwort. A common fern on dry, rocky soil at elevations of 3,000 to 8,000 feet.

ASPLENIUM UNILATERALE Lamarck. Pamoho. *Asplenium resectum* Smith. Not very common, found on shady, wet cliffs in First Twin Crater.

ATHYRIUM POIRETIANUM (Gaudichaud) Presl. Endemic. *Asplenium aspidioides* of Hilleb., not Schlecht. *Asplenium multisectum* Brack. In very damp woods and in wet craters.

CEROPTERIS OCHRACEA (Presl) Rob. Silver Fern. An escape. Very common in the vicinity of steam cracks throughout the Park.

CONIOGRAMME PILOSA (Brack.) Hieronymus. Loulu. *Gymnogramme javanica* of Hilleb., not Bl. Wet cliffs at altitudes of 3,000 to 5,000 feet. Common in First Twin Crater.

CYRTOMIUM CARYOTIDEUM (Wallich) Presl. Kaaepeape. *Aspidium caryotideum* Wallich. Occasional; along the edge of lava flow which delimits Kipuka Puaulu.

DIPLAZIUM SANDWICHIANUM (Presl) Diels. Endemic. *Asplenium sandwichianum* Hooker. Common in shady, moist localities, especially in craters.

DRYOPTERIS DECORA Brack. Endemic. *Pteris decora* Hooker. Very common in lava cracks at Hilina Pali and throughout Kau Desert.

DRYOPTERIS sp. Collected in a moderately dry hole at Hilina Pali. Doctor Lyon writes that it is a new arrival in the Hawaiian Islands and seems to be intermediate between a South American and an Asiatic form. He made his first and only collection near Hilo in 1919.

DRYOPTERIS CYATHEOIDES (Kaulf.) O. Kuntze. Kikawaeo. *Aspidium truncatum* Gaud. Very common throughout rain forest. The young shoots were eaten either as a raw vegetable or were cooked with meat and taro.

DRYOPTERIS GLABRA (Brack.) O. Kuntze. Kilau. Endemic. *Aspidium glabrum* Mett. Occasional, in open forests. Fine specimens may be seen in Kipuka Puaulu.

DRYOPTERIS GLOBULIFERA (Brack.) O. Kuntze. Palapalai O Kaumaapua. *Aspidium globuliferum* Mann. Common in the rain forest near Thurston's Lava Tube.

DRYOPTERIS HAWAIIENSIS (Hilleb.) Rob. Endemic. *Aspidium hawaiiense* Hilleb. Open forest in Kipuka Puaulu. Not common elsewhere.

DRYOPTERIS PALEACEA (Swartz) C. Chr. Laukahi. *Aspidium filix-mas* var. *parallelogrammum* Kunze. Rare; found in open forest in Kipuka Puaulu.

DRYOPTERIS PARASITICA (L.) O. Kuntze. Downy

Woodfern. Common in shady, damp places at Hilina Pali and in the craters along the Chain of Craters' Road.

DRYOPTERIS STEGNOGRAMMOIDES (Baker) C. Chr. Endemic. *Phegopteris polycarpa* (Hooker & Arnott) Hilleb. Common in shady, moist localities along the Kilauea Iki Trail.

DRYOPTERIS UNIDENTATA (Hooker & Arnott) C. Chr. Akole. Endemic. *Phegopteris unidentata* Mann. Found only in a dry, rocky gulch near the Half Way House near the Kau entrance.

ELAPHOGLOSSUM CONFORME (Swartz) Schott. Ekaha, Maui's Paddle. *Acrostichum conforme* Swartz. Common on rocks and trees in the rain forest at elevations of 1,000 to 4,500 feet.

ELAPHOGLOSSUM HIRTUM (Swartz) C. Chr. Ekaha. *Acrostichum squamosum* of Hilleb., not Sw. Common on the trunks of Ohia trees (*Metrosideros collina* var. *polymorpha*) and on exposed ridges at elevations of 3,000 to 4,000 feet.

ELAPHOGLOSSUM MICRADENIUM (Fée) Moore. Maui's Paddle, Ekaha. Epiphyte. Collected by Degener in woods near Waldon Ledge.

ELAPHOGLOSSUM RETICULATUM (Kaulfuss) Gaud. Ekaha. Endemic. *Acrostichum reticulatum* Kaulfuss. Common on rocks and trees in the rain forest.

MICROLEPIA STRIGOSA (Thunberg) Presl. Palapalai. Common on moderately moist soil and on the outskirts of woods.

NEPHROLEPIS EXALTATA (L.) Schott. Sword Fern, Okupukupu. Common throughout the humid regions of the Park and in the vicinity of steam cracks near Kilauea. A variable species.

PELLAEA TERNIFOLIA (Cavanilles) Link. Cliff Brake, Laukahi. Very common in arid regions of the Park from Hilina Pali to an elevation of about 9,500 feet.

POLYPODIUM HOOKERI Brack. Hooker's Polypody. Common epiphyte throughout rain forest.

POLYPODIUM HYMENOPHYLLOIDES Kaulfuss. Pai. Endemic. Epiphyte in rain forest at elevations of 3,000 to 4,000 feet.

POLYPODIUM LINEARE Thunberg. Ekaha Akolea. *Phymatodes elongata* (Kaulfuss) Rob. A common species found growing on trees and rocks throughout the Park. Fronds occasionally forked.

POLYPODIUM PELLUCIDUM Kaulfuss. Ae, Pellucid Polypody. Endemic. Common in open woods near Kilauea and along the Chain of Craters' Road. Commonly an epiphyte in rain forest.

POLYPODIUM PSEUDOGRAMMITIS Gaudichaud. Kolokolo. Endemic. A very common epiphyte in rain forest.

POLYPODIUM SAFFORDII Maxon. Kihi. Endemic. *P. serrulatum* of Hilleb., not (Sw.) Mett. Occasional; on moss-covered tree trunks in rain forest.

POLYPODIUM SARMENTOSUM Brack. Endemic. Common epiphyte in rain forest.

POLYPODIUM TAMARISCINUM Kaulfuss. Wahine Noho Mauna, "The Mistress of the Mountain." Endemic. Epiphyte; common in rain forest.

PTERIDIUM AQUILINUM (L.) Kuhn. Bracken, Kilau. *Pteris aquilina* L. Common in the drier regions of the Park from Hilina Pali to an elevation of approximately 9,000 feet.

PTERIS CRETICA L. Owalii, Cretan Brake. Occasional; found in Kipuka Puaulu, First Twin Crater, along the Sandalwood trail and Kilauea Iki trail.

PTERIS EXCELSA Gaudichaud. Waimakanui. Occasional; found in open forests of Kipuka Puaulu.

PTERIS LONGIFOLIA L. Long-leaved Brake. Common in vicinity of steam cracks near Kilauea, and along the road by the Chain of Craters.

SADLERIA CYATHEOIDES Kaulfuss. Amaumau. Widely

distributed in the Park, occurring in both wet and dry habitats. The Hawaiians prepared a red dye from the outer part of the trunk which they used in dyeing kapa.

SADLERIA HILLEBRANDII Rob. Amau. Endemic. Common in humid regions near Kilauea. The leaves were occasionally used in lining and thatching houses. The young leaves and pith of the stems were cooked for food.

SPHENOMERIS CHUSANA (L.) Copeland. Palaa. *Odontosoria chinensis* (L.) J. Smith. *Microlepia tenuifolia* Mettenius. Common at Hilina Pali and in the vicinity of steam cracks near Kilauea. A red dye was prepared from the leaves.

LYCOPODIACEAE

LYCOPODIUM CERNUUM L. Wawaeiole, Clubmoss. Very common in open places throughout the eastern half of the Park, frequently forming dense thickets with *Gleichenia emarginata*. Degener reports that Hawaiians suffering from rheumatism bathed in water in which Wawaeiole had been boiled for three hours.

LYCOPODIUM PHYLLANTHUM Hooker & Arnott. Clubmoss, Wawaeiole. Occasional; found on moss-covered trees near Napau Crater.

LYCOPODIUM POLYTRICHOIDES Kaulfuss. Wawaeiole. Endemic. Occasional; found on moss-covered trees near Napau Crater.

LYCOPODIUM VENUSTULUM Gaudichaud. Wawaeiole. Endemic. Common prostrate fern along the Napau Crater Trail.

PSILOTACEAE

PSILOTUM COMPLANATUM Swartz. Moa. Occasional; on trees in rain forest.

PSILOTUM NUDUM (L.) Grisebach. Moa, Pipi, Psilotum. *P. triquetrum* Swartz. Common on trees and rocks in the drier regions of the Park below 4,500 feet. Babies

suffering from "thrush" or "ea" were given a tea prepared from Moa. Powdered sporangia were used on skin inflammation caused by wearing the "malo" or loin cloth. Moa was used by the Hawaiians in a game called "fighting cock."

SELAGINELLACEAE

SELAGINELLA ARBUSCULA (Kaulfuss) Spring. Selaginella. Endemic. Occasional; in rain forest near Makapuhi and Napu Craters.

SELAGINELLA MENZIESII (Hooker & Greville) Spring. Occasional; in rain forest near Napau Crater.

SPECIES REPORTED FROM AREAS ADJACENT TO THE PARK

<i>Asplenium contiguum</i> var. <i>laciniatum</i> Hilleb.	Collected by Fowler
<i>Diplazium arnottii</i> Brack.	" " Fowler
<i>Dryopteris keraudreniana</i> (Gaud.) C. Chr.	" " Skottsberg
<i>Elaphoglossum gorgoneum</i> Kaulfuss	" " Degener
<i>Gleichenia glauca</i> Hooker	" " Degener
<i>Gleichenia linearis</i> Clarke	" " Degener
<i>Lycopodium serratum</i> Thunberg	" " Degener
<i>Marattia douglasii</i> (Presl) Baker	" " Fowler
<i>Trichomanes bauerianum</i> Endl.	" " Degener
<i>Pteris irregularis</i> Kaulfuss	" " Degener

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A New Philippine Isoetes

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In a collection of Philippine botanical material recently received from Mr. A. Lynn Zwickey, the apparently new *Isoetes*, described below, was noted. What is of even greater interest than the discovery of an undescribed species in this small group is the fact that this is the first record of the occurrence of a representative of the family in the Philippines; for, in the vast expanse of the Malay Archipelago, including the Philippines, but a single species was hitherto known, *Isoetes neoguineensis* Baker, from the high mountains of New Guinea.

Van Alderwerelt van Rosenburgh,¹ in his comprehensive treatment of the Fern Allies of Malaysia in 1915, indicated in his key to the families and genera: "ISOETACEAE; not in Malaya." Ridley's² later treatment of

¹ Van Alderwerelt van Rosenburgh, C. W. R. K. Malayan Fern Allies. Handbook to the determination of the fern allies of the Malayan Islands (incl. those of the Malay Peninsula, the Philippines, and New Guinea). Pp. xvi + 261. 1915.

² Ridley, H. N. The Fern Allies and Characeae of the Malay Peninsula. Jour. Straits Branch Roy. As. Soc. 80: 139-164. 1919.